Towards a Personalized E-Government Platform

Imane Zaoui*, Hajar Elmaghraoui, ELaila Benhlima, Dalila Chiadmi

 Mohammadia School of Enginners (EMI), Mohammed Vth University, Rabat, Kingdom of Morocco.
Email: imane.zaoui@gmail.com
* Corresponding author.

ABSTRACT

It cannot be denied that e-Government plays a crucial role in modernizing public sectors and developing social and economic life of citizens. To raise these challenges, our country has adopted since 2009 the e-Moroccan strategy that aims to facilitate the access and the use of administration services. One of the main issues of this strategy is to insure interoperability between all administrations and to provide services that are tailored to each citizen profile. To support the e-Morocco solution, we draw in this article a framework for the implementation of a personalized e-government. Our solution is based on three components: an interoperability platform called WASSIT which is a mediation system that provides data integration and dynamic composition of e-services, a personalization platform called 2P-Med that customize services to each user profile, and finally a single sign portal that offers a transparent and secure access to all administration services. In addition to this framework, we underline a set of measures and best practices that should insure the success of our proposal in the Moroccan context.

KEYWORDS

E-Government — Personalization Mediation system — User profile.

1. Introduction

E-government plays a major role in the development of social and economic reform in developing countries [1]. It is an important tool used to modernize the public sector, to realize democracy and to achieve a good governance. Today, the maturity of an administration is measured by the degree of involvement of ICT services [2]. Thus, we distinguish three levels of e-Government maturity depending on the relationship between the administration and its customers either they are citizens or businesses. The first level is the *informational e-Government*, where the administration informs potential users through websites and provides them with institutional documents like decrees of laws and governmental studies. The second level is the *unidirectional e-Government* where users and administrations communicate but only in a single direction at a time. The typical example is that of online forms to download or to fill directly. Finally, the last level is the *transactional e-Government*. At this stage, complex and transactional e-services involve users and administration according to well-defined processes. Among transactional services, we mention online enterprise creation, e-taxes declaring and payment, e-voting and e-health applications.

In order to draw an accurate image of the degree of e-Government maturity, the UN Global E-Government Readiness survey measures many indicators and ranks countries according

to their ICT scores [3]. Thereby, Morocco has been ranked at position 126. This low rank can be explained by the high cost of the implementation and the maintenance of e-services and the low rate of their use. This situation leads to a low return on investment of Moroccan e-Gov applications. In addition, several reports have also highlighted the dissatisfaction of users of e-services they deem not adapted to their needs and contexts.

In this paper, we provide a solution to the previous issues. We aim to support the e-Moroccan strategy to a fourth level of maturity that we call personalized e-Government. The foundation of our solution is a framework called PersoGov. PersoGov is composed of three platforms. The first one is a mediation system called WASSIT. The role of WASSIT is to insure the interoperability of the underling administration sources and to provide data integration and dynamic web service composition. The second one is a personalization platform called 2P-Med. This platform captures and manages user profiles in order to provide users with adapted services and relevant information. The third component is a single sign on portal which provides a secure, transparent and personalized access to all administration services.

The rest of this paper is organized as follows. In section 2, we explain the personalized e-Government maturity level. Then, in section 3, we present the architecture of PersoGov. Section 4

describes how it works. We give some related works in section 5 and we conclude in section 6.

2. THE PERSONALIZED E-GOVERNMENT MATURITY LEVEL

The goal of e-Gov is to allow the client to interact with the administration in an efficient, transparent and secure way. This interaction may concern purchasing information or documents, filling forms to get some certificate or declare some events; it may also involve several administrations that cooperate to offer a complex service. In this section we present the progress of the E-Moroccan strategy and the success keys to achieve the personalized E-Gov Maturity Level.

2.1 MOROCAN e-GOV PROGRESS

Until now, the Moroccan e-Gov strategy has attempts to cover the first maturity levels. In fact, according to the e-Gov study performed by the commerce, Industry, and NTIC department [4], the number of official websites has considerably growth. Almost all departments have got their own portal where they share official information and documents. Some transactional initiatives have also succeeded to deliver end to end online services. We particularly mention the SIMPL project [5] where citizens can declare and pay their taxes online, the GID platform [6] which provides G2G services to manage department budgets. Unfortunately these initiatives involve only a single department.

Although the e-Moroccan strategy has developed several e-services and facilitates many administrative procedures, Moroccan e-gov is still facing two main challenges: The first one is bridging organizational silos. This kind of organizational refers to departments that are working independently to their functional interests and goals. Silos greatly increase the costs of implementation and maintenance of e-services especially transactional ones which involves several departments. A solution for this problem is to develop a Mediation system that offers a transparent access to all department sources and solves interoperability problems.

The second challenge is to increase the usage rate of e-Gov services. This is possible through personalizing e-Gov services. Personalization aims at improving user satisfaction by offering relevant and appropriate services.

By bridging silos and personalizing e-gov services, we achieve a maturity level beyond transactional e-Government. This is the personalized e-Gov level. However, to reach this objective, some success keys should be insured into the Moroccan context.

2.2 SUCCESS KEYS ISSUES

Beyond any e-Gov strategy, there is a need to create an opportune environment which will help achieving e-Gov goals. This environment requires a good e-governance. It needs to establish the necessary infrastructure, to develop user oriented services and application with a high value added, and of course to measure the e-Gov performances. We present these success keys in the following.

E-Governance: A strong leadership is necessary to develop legacy context, ICT policies and standards that must be respected by all administrations. The e-governance also guaranties the transparency and data sharing between all departments.

Infrastructure: There is a need to connect all administration through a performing network backbone. The infrastructure must insure connectivity, accessibility, security and data processing capacity.

User oriented application and services: This is about putting the user in the middle of Moroccan e-Gov strategy. This could be achieved by: i) involving users during designing and developing new services, ii) supporting personalization services which are based on user profiles, for example content and context adaptation, collaborative filtering, recommendation, and iii) advertizing e-services. By adopting a user oriented policy, we improve user satisfaction and we increase the usage rate of e-Gov services at the same time.

Impact analysis: Measuring the success of e-Gov initiatives should include defining indicators like percentage of user access, coverage rate, Return on Investment, top requested services, etc. The impact analysis gives a clear idea about the efficiency of e-Moroccan strategy and reflects the user satisfaction among e-Gov services. It is an important tool to perform the business process reengineering (BPR) that may correct all deficiencies into the e-Gov policy.

3. THE PERSOGOV FRAMEWORK

To achieve the personalized e-Gov maturity level, we propose a framework called PersoGov that offers transactional e-services in a simple, secure and personalized way.

3.1 THE BASIC ARCHITECTURE

The basic architecture of our framework is described in Figure 1, PersoGov is composed of the following platforms:

1. A mediation system called WASSIT: integrates the data and insure the discovery and orchestration of e-services.

2. A Personalization Platform called 2P-Med: identifies users through their profiles and provides personalized services.

3. A single interaction portal: provides a simple and secure access to all e-services regardless of their origin. This window respects the single sign on principle and contains basic functionalities such as research, mailing, account creation and user profile authentication.

4. A knowledge base that stores all required data to insure a good working of WASSIT, 2P-Med and the Portal. For example, it contains a user profile database, a service repository, business processes, rules and safety management protocols. Due to the lack of space, we focus in this paper only on WASSIT and 2P-Med.
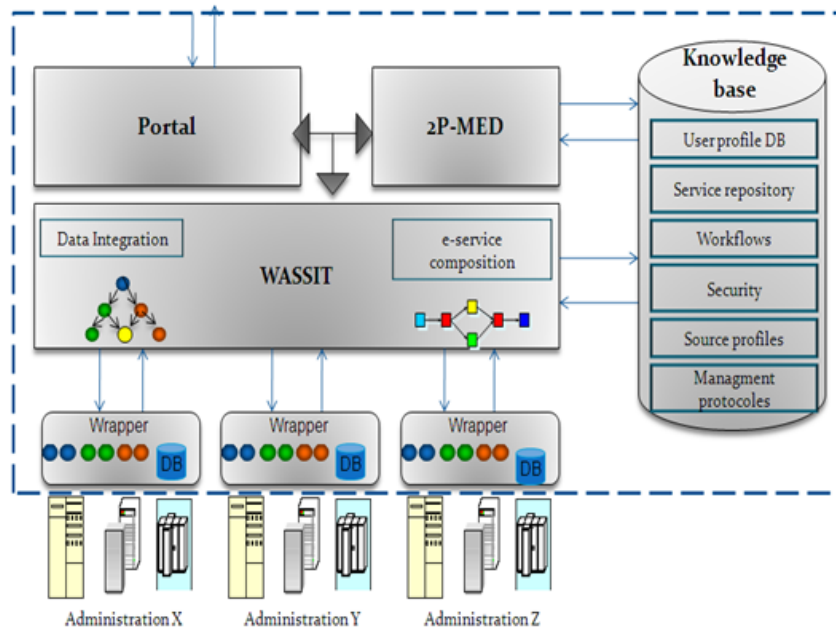
Figure 1. *: PersoGov Architecture.*

3.2 THE MEDIATION SYSTEM WASSIT

WASSIT [7][8] is a mediation system used to bridge organizational silos in different departments. It allows integrating disparate, heterogeneous and autonomous data sources by resolving interoperability problems. The underling sources belong to the department silos. It could be databases, web service repositories, websites, XML files or even unstructured documents. WASSIT relies on the well-known mediator architecture [9]. The system is mainly made up of two principal components: Mediator and Wrappers. The Mediator, which is the query processing core of WASSIT, has to decompose a user query into a set of sub-queries targeted to the sources. Each sub-query is then transmitted to the corresponding source via the associated wrapper. The answers delivered by the wrappers are then combined to form the response to the initial user query [10]. The architecture of WASSIT is divided in three levels.

- *The source level* includes the data sources and the wrappers which translates the sub queries to the source query language and format the returned result in an XML format which is the language supported by the mediator.

- *The mediation level* contains the mediator. The first role of the mediator is to analyze the user query and to perform a semantic enrichment. Then, the mediator rewrites this query and generates a QEP(Query execution Plan). The QEP is a tree where leaves are sub queries and nodes the combining operators like Union, Jointure, Projection, etc. This QEP is then optimized by taking into account the source capabilities [11] before being executed. The execution includes sending the generated sub queries to the targeted sources and composing responses according

to the QEP. Finally an integrated response is returned to the user in XML format.

- *The user level* contains the interface that links WASSIT with the personalization platform 2P-Med.

3.3 THE PERSONNALIZATION PLATFORM 2P-Med

2P–Med [12] is a personalization platform that allows personalizing WASSIT's responses. Thus, 2P-Med adapts the e-Gov services to each user profile. Adaptation concerns delivering relevant content, recommending adequate services and selecting the best sources that will participate to create an integrated response. It also concerns customizing the results in terms of layouts, colors, etc in order to respect the user context and preferences. 2P-Med contains three components presented in figure 2:

- *The User Manager* : This component creates and manages user profiles while ensuring the confidentiality and security of personal data. It updates user profile automatically by analyzing user behavior and user relevancy feedback. Finally, it provides authentication mechanisms that recognize the user through his profile. The user profile supported by the component is a multidimensional one. It is divided into two parts: a persistent profile which contains static information like user identity and user interests and a session profile which describes user goals, context and preferences related to a given session [13].

- *The Source Manager*: This component creates and manages sources profiles. The concept of source profile has been adopted to describe the content, the quality
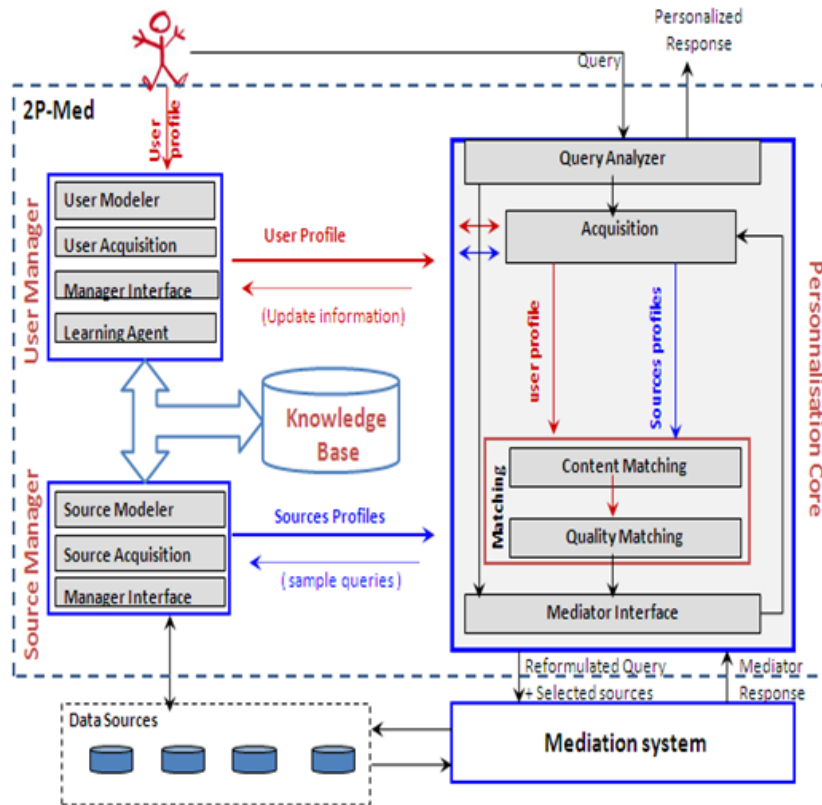
Figure 2. *: 2P-Med architecture.*

and the characteristics of a source. Indeed the source manager builds a multidimensional source profile which contains the identity dimension (Source URL, source owner, Source local schema, access protocols, querying languages..) the content dimension which is an index of the most important concepts treated by the source. The ontology dimension which gives the semantic relationship between the concepts, the quality dimension includes a set of quality parameters like freshness, popularity, response time, etc. Finally the security dimension indicates all access rights and security rules to Access the source [14].

- *The Personalization Core*: This component performs all personalization services. These services are: i) select a set of relevant sources which contains data or e-services that answer user query and respect his profile as well. This selection is performed using matching algorithms [14], ii) adapt the query results according to user context and preferences [15]. iii) Measure user satisfaction and handle user relevancy feedbacks iv) recommend relevant services according to user profile and his feedbacks.

4. PERSOGOV WORKING

4.1 RUNNING EXAMPLE

To illustrate our solution, let's consider the following scenario. Toto is a citizen who is visually impaired. He has changed his address and he wants to update his identity card and passport. Toto also needs to transfer his medical file to the hospital in the city where he moved, and he must register his children in schools near his new residence. Toto is now traveling so he wants to access the e-services through his smart phone. Actual Moroccan e-Gov services doesn't consider neither his handicap, nor his mobile context, Furthermore, Toto has first to learn more about the procedures to follow and then to seek each service separately from the adequate department portal. Thus it is clear that using e-services related to changing address becomes very disappointing experience.

With PersoGov, Toto accesses all e-services related to changing address from the persoGov portal via his smart phone. All he has to do is to connect to the portal, register his profile which includes his context, interests and preferences. Then he must sign on to be authenticated and he enters his query. The query could be for example a set of key words for example: "changing address, passport, CIN, hospital school".

Based on TOTO's profile and query, PersoGov selects a set of relevant sources from different department and answers the query by integrating all data from the selected sources. The final result is then adapted to his handicap and his context. Indeed, responses are displayed in big characters on his smart

Phone. Another advantage of PersoGov, is recommendation. The system is also able to recommend e-Gov services based on the user interaction history and other similar user profiles. Thus, PersoGov recommends other e-services that may interest TOTO like "procedure to get residential certificate", "contact of prefecture", "bus and tramway lines", ...etc.

In the next paragraph, we highlight the process executed by PersoGov to personalize Moroccan e-Gov.

4.2 EXECUTION PROCESS

For each user, PersoGov execute the following process:

- Step 1: Authentication and profiling. In this stage user registers to PersoGov, He creates his profile and log on to the PersoGov portal. After successful authentication, User is able to interact with PersoGov. This stage involves the portal and 2P-Med platform

- Step 2: Interaction. In this stage, user began his interaction with PersoGov. Interaction includes expressing queries, selecting e-services and updating profiles. This stage uses the portal for entering queries and getting results, 2P-Med for updating the profiles and WASSIT for answering queries.

- Step 3: Personalization. This stage is performed in parallel with stage 2. Indeed PersoGov, selects relevant sources at 2P-Med Level. These sources are then integrated by WASSIT to get a personalized answer. Finally 2P-Med adapts the results to the user profile, especially to his context and preferences. The Personalization stage also concerns delivering relevant recommendations.

- Step 4: Feedback Measurement. Among delivered results and recommended e-services, user could express his satisfaction and mention his feedback through PersoGov Portal. User scores relevant results and e-services from 1(very bad) to 5(excellent). This stage is necessary to undertake corrective measures in order to improve the quality of personalization.

This personalization process is cyclical. It is run over multiple interaction sessions for each user. Thereby, refining the user profile to make services better and more relevant.

5. RELATED WORKS

According to the Organization of Economic Cooperation and Development (OECD) [16], e-government initiatives in recent years are focusing on issues, such as how to collaborate more effectively across agencies to address complex intra-government problems and how to enhance public satisfaction and increase e-service usage Among the first objective, numerous e-government interoperability frameworks have been proposed in different countries; such as UK e-Government Interoperability Framework [17] and NZ e-Government Interoperability Framework [18]. To attempt the second objective, personalization techniques has been introduced. These techniques are essentially related to how e-services are organized in portals. We distinguish two approaches:

Life event based portals [19][20]: By definition, a life event is "a situation of a human being that triggers public services" [6], for example: getting married, getting retired, changing address, or applying to a job. It constitutes a grouping mechanism of public e-services according to citizen needs.

Stereotype profiling: A stereotype profile can be defined as identity that is used for a general description of set of similar users. For example, the portal of the Moroccan retiring direction (www.rcar.ma) organizes its services according to three stereotypes: member, retired and business. Stereotypes are also used in collaborative filtering and recommendation.

Although Life events and stereotypes helps the user to find easily e-services that correspond to his interests, it couldn't represent all life situations neither respects user particular needs, preferences, and context.

Some e-Gov projects have succeeded in achieving a high level of personalized e-Gov maturity level. For instance, the OneStopGov Project (www.onestopgov-project.org) provides life event oriented e-services, using a single sign-on platform which resolves interoperability and integration problems. Another example is the Advanced e-Government Information Service Bus (eGov-Bus) (www.egovbus.org) which is a dynamically adapted information system supporting daily event life of users. The last example is the Public Agency Networking Platform (PANP)[20] which aims at facilitating personalized cross-organizational services.

We take advantage of all the above initiatives in order to propose a solution that is adapted to the Moroccan context. Our platform PersoGov allows cross organizational connection and bridging silos while providing users with a single-sign-on portal and personalization features.

6. CONCLUSION

The current challenge for Moroccan e-government is to attempt the personalized maturity level. To support the Moroccan e-Gov strategy, we underline in this paper a personalization framework called PersoGov. Our solution is based on three main components: the first one is WASSIT. It is a mediation system which helps bridging organizational silos and insures cross organizational connectivity. The second component is 2P-Med. This is a personalization platform used to personalize WASSIT's responses. It also provides many personalization services based on a multidimensional user profile. The third component is a single sign on portal which is considered as a one stop government .It is the interaction window with PersoGov. The portal provides a unique access to all available services, user authentication, secure interaction and user profile handling. By using PersoGov, we aim at making communication between Moroccan departments and clients more effective and efficient while reducing bureaucracy. We also expect increasing user satisfaction and usage rate of e-services while reducing implementation and maintenance costs.

References

[1] Andersen, A., E-Gouvernement: Réflexions sur l'utilisation des nouvelles technologies de l'information et de la communication par les collectivités publiques, Business Consulting Arthur Anderson, 2000.

[2] Maté Hernadez, J. L., e-gouvernement: des citoyens aux clients, E-gouvernement/ e-administration dans la sécurité sociale. Genève, Association internationale de la sécurité sociale, 2002.

[3] United Nations: E-Government Survey Leveraging E-government at the time of financial and economic crisis, 2010

[4] Ministry of Industry, Trade and New Technologies: Morrocan e-Gov program anual report, 2011.

[5] Direction Générale des Impots du Maroc, SIMPL Project, http://www.tax.gov.ma/wps/portal/SimplTVA

[6] Trésorerie générale du royaune: Public Depense Cartographie Report, 2005.

[7] Zellou, A., Contribution to the LAV rewriting in the context of WASSIT, a resources integration framework. *Ph.D. dissertation*, Computer Sciences Department, Mohammadia Engineering School, Rabat, Morocco, 2008.

[8] Benhlima, L., Chiadmi, D., Moujane, A., et Gounbark, L., Construction de la base de connaissances pour WASSIT. *Journal marocain d'automatique, d'informatique et de traitement de signal*, 2007, vol. 3, no. 3.

[9] WIEDERHOLD, Gio, Mediators in the architecture of future information systems. Computer, 1992, vol. 25, no 3, p. 38-49.

[10] WADJINNY, Faouzia, GOUNBARK, Lahcen, BENHLIMA, Laila, et al. Query processing in the WASSIT mediation framework. *In : Computer Systems and Applications, 2009. AICCSA 2009. IEEE/ACS International Conference on. IEEE*, 2009. p. 595-602

[11] Wadjinny, F., Adaptation des requetes aux capacites de sources dans un système de mediation. *Ph.D. dissertation, Computer Sciences Department, Mohammadia Engineering School*, Rabat, Morocco, 2010

[12] Zaoui, I., Chiadmi, D., Benhlima, L., Building 2P-Med, A personnalization plateform for mediation. In IJEST (International Journal of Engeneering Science and Technologies) ISSN: 0975-5462, 2011, vol. 3, no. 5.

[13] Zaoui, I., Wadjinny, F., Chiadmi, D., Benhlima, L., Construction d'un profil utilisateur pour un médiateur de bibliothèques électroniques, *Proceeding of WOTIC*, Agadir, Morocco, 2009.

[14] Zaoui, I., Wadjinny, F., Chiadmi, D., Benhlima, L., Towards a personnalized data source selection in the context of mediation systems. *In the Third International Conference on Web and Information Technologies*, ISBN: 978-9954-9083-0-3, Marrakech, 2010, p. 449-460.

[15] WADJINNY, Faouzia, ZAOUI, Imane, MOUJANE, Ahmed, et al. Integrating Disparate Digital Libraries using the WASSIT Mediation Framework, pp. 69, 2011.

[16] OECD, The e-government imperative: Main findings, OECD Observer Report, 2003 www.oecd.org/publication/Pol_brief

[17] E-Government Interoperability Framework, Version6.1(UK),

[18] New Zealand E-government Interoperability Framework(NZ e-GIF), Version 3.2 http://www.e.govt.nz/plone/archive/standards/e-gif.1.html

[19] M. Momotko, W. Izdebski, E. Tambouris, K. Tarabanis and M. Vintar, An Architecture of Active Life Event Portals: Generic Workflow Approach, *Lecture Notes in Computer Science*, vol. 4656/2007, pp. 104-115, 2007.

[20] DAIS, Alexandros, NIKOLAIDOU, Mara, ALEXOPOULOU, Nancy, et al. Introducing a public agency networking platform towards supporting connected governance. *In : Electronic Government*. Springer Berlin Heidelberg, 2008. p. 375-387.